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ABSTRACT

During the summers of 1970 and 1971, the Human Resources Research Organization presented a special inservice training program to elementary teachers of the River Rouge, Michigan, School District. This report evaluates the effects of this training program and focuses on the determination of gains in student achievement that may be attributed to the program. The training program--a series of workshops plus immediate follow-on efforts--sought to increase achievement in students by changing instructional practices used by teachers. The workshops focused on the following educational practices: (1) development and use of instructional objectives; (2) implementation of concepts of learning modules and mastery tests; and (3) employment of contingency management techniques in the classroom. For grades 2-7, students of program teachers gained almost twice as much on a standardized achievement test as did students of non-program teachers; differences in mean gain scores in reading and mathematics were both highly significant. For grades K-1, students of program teachers tended to have higher gain scores than students taught by non-program teachers, but the differences were small. No single factor appears to account for the enhanced student gains produced by program teachers. They were apparently due to the integration of workshop training, trial implementation, classroom observation, availability of teacher aides, and frequent guidance and assistance provided to teachers. (Appendices include: teacher performance objectives; program coordinator performance objectives; inferred achievement test objectives with sample test items; teacher questionnaire; administrator questionnaire; and agreement between project teachers and program coordinator.) (MM)

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Paul G. Whitmore, William H. Melching, and
Edward W. Frederickson

HUMAN RESOURCES RESEARCH ORGANIZATION
300 North Washington Street • Alexandria, Virginia 22314

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Prepared for:

River Rouge School District
River Rouge, Michigan

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HumRRO Division No. 5
Fort Bliss, Texas

HUMAN RESOURCES RESEARCH ORGANIZATION

October 1972

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River Rouge School District
River Rouge, Michigan

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This report evaluates the effects of special inservice training of a group of elementary teachers. The training program—a series of workshops plus immediate follow-on efforts—sought to increase achievement in students by changing instructional practices used by the teachers. For grades 2-7, students of program teachers gained almost twice as much on a standardized achievement test as did students of non-program teachers; differences in mean gain scores in reading and mathematics were both highly significant. For grades K-1, students of program teachers tended to have higher gain scores than students taught by non-program teachers, but the differences were small. No single factor appears to account for the enhanced student gains produced by program teachers. These gains were apparently due to the integration of workshop training, trial implementation, classroom observation, availability of teacher aides, and frequent guidance and assistance provided to teachers.

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FOREWORD

This report evaluates the results of a teacher inservice training program conducted by the Human Resources Research Organization for the River Rouge, Michigan School District. The program was designed to bring about improvements in the achievement of students by changing the instructional processes used by teachers in the classroom.

The report is concerned with evaluating the program at the end of its second year of operation. The primary emphasis of the evaluation is on the determination of gains in student achievement that may be attributed to changes in instructional processes introduced by program teachers.

The training was conducted by HumRRO Division No. 5, El Paso, Texas, Dr. Albert L. Kubala, Director. Dr. William H. Melching was the principal investigator and Dr. Paul G. Whitmore participated throughout in the conduct of the work. During the first year of the work, Dr. Edward W. Frederickson assisted in presenting workshops and in guiding follow-on efforts.

Special assistance in scheduling and arranging the workshops and in guiding teachers during follow-on efforts was provided by Mr. Fredric A. Rivkin, Director of Federal Projects for the River Rouge School District.

The training program and evaluation were conducted under contract with the River Rouge, Michigan School District.

Meredith P. Crawford
President
Human Resources Research Organization

SUMMARY AND CONCLUSIONS

PROBLEM

During the summers of 1970 and 1971, the Human Resources Research Organization presented a series of workshops to elementary teachers of the River Rouge, Michigan School District. The workshops and associated follow-on efforts sought to bring about increased student achievement by changing instructional practices used by the teachers.

This report is concerned with evaluating the program at the end of its second year of operation. The focus of the evaluation is primarily on determining the amount of gain in student achievement that might be attributed to the program.

METHOD

The workshops focused on the following educational practices:

Development and Use of Instructional Objectives
Implementation of Concepts of Learning Modules and Mastery Tests
Employment of Contingency Management Techniques in the Classroom

Workshops on these topics were designed to provide participants with first-hand practice and experience. During the school year following each summer workshop, a follow-on program was conducted. Its goal was to increase the probability of successful attempts by teachers to implement the techniques and procedures they had learned. Support for the teachers was provided by personnel from the School District and by visits from a team of HumRRO researchers. Numerous inservice meetings with teachers were held throughout the two school years.

Although program teachers had developed and used behavioral objectives for their classes, there was no assurance that standardized test objectives were included. However, since funding from the state for the program was contingent upon attainment of a specified gain on a standardized test, it was felt that test objectives should be made available to teachers. Since such objectives were unavailable from the publisher, they were constructed by the authors by inference from items on one form of the test. Sample test items were then developed from the test objectives and provided to each program teacher. Teachers were informed how the test objectives were made and were encouraged to generate additional test items. No effort was made to control the extent to which teachers used such materials in their classes. For evaluation purposes, students with a test achievement one year or more below grade level were designated target students. Such students were selected only from classes of program teachers.

RESULTS

Grades 2-7

(1) Target students readily achieved the gain in achievement required by the state.

(2) Gains of target students were not obtained at the expense of non-target students of program teachers, for the mean gain of non-target students was actually greater. However, the difference was small and not statistically significant.

(3) When scores of target and non-target students of program teachers were combined and their mean scores compared with students of non-program teachers, the results

showed that the students of program teachers gained significantly more. In fact, students of program teachers gained almost twice as much as did students of non-program teachers.

(4) Pretest scores of students of program teachers were found to be equal to or slightly less (in 9 of 12 cases) than pretest scores of students of non-program teachers, thereby discounting the possibility that the results could be attributed to pretest differences.

Grades K-1

Mean gain scores of students of program teachers tended to be larger than those of non-program teachers, but the differences were small and inconsistent. No statistical tests were performed.

CONCLUSIONS

Several program aspects may have been influential with respect to the achievement gains showed by students, but no one single factor would seem to be primarily responsible. Teachers acquired not only new classroom techniques but also new ways of conceiving teacher-student interaction and responsibilities. The outward effect of these new conceptions was an improved level of teacher functioning. There was a more concerted effort to bring students up in achievement, and this was possible because the classroom atmosphere was more conducive to learning; that is, more children were assigned learning tasks at which they could succeed and for which they could receive recognition and approval with a minimum use of coercion or threat.

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Gain in Student Achievement as a Function of Inservice Teacher Training in Classroom Management Techniques

BACKGROUND

PROBLEM

In the spring of 1970 the River Rouge, Michigan School District contracted with the Human Resources Research Organization to help plan and conduct a program to increase the achievement of children in its four elementary schools. The resulting program consisted of teacher workshops and follow-on efforts designed to bring about improvements in the achievement of students by changing the instructional processes used by teachers in the classroom.

This report is concerned with the evaluation of the program at the end of its second year of operation. The primary emphasis of the evaluation is on the determination of gains in student achievement attributable to the changes in instructional processes introduced by the program teachers.

A complete description of the activities of the set of workshops was prepared previously (1), but to aid the reader with the current report, a general review of the rationale and goals of the workshops will be presented here.

TEACHER WORKSHOPS

Two successive groups of teachers were trained by means of a series of inservice teacher workshops conducted during the summers of the two years of the program's operation (1970 and 1971). During the first year, 24 teachers entered the program, and an additional 25 were added during the second year. Teachers were accepted into the program on a voluntary basis only. However, they were paid for their participation in the summer workshops and each one was assigned a teacher aide during the regular school year. Program teachers were the only teachers in the River Rouge School District who had teacher aides.

The instructional processes that these workshops sought to establish in the classroom are based on the premise that poor academic performance is largely caused by inadequate use of rewards or reinforcers, combined with inadequately stated and inadequately applied instructional goals and too low a learning criterion. These deficiencies in instructional processes often result in high rates of nonproductive or escape behaviors on the part of the children, vaguely defined and perhaps misdirected instructional activities, a learning environment in which failure and its debilitating effects are unnecessarily imposed upon many of the children, and an accumulation of habit interference between previously learned behavior and new behaviors.

The workshops focused on the following educational practices:

Development and use of instructional objectives.

Implementation of concepts of learning modules and mastery tests.

Employment of contingency management techniques in the classroom.

Workshops on these topics were designed to provide participants with first-hand practice and experience. Numerous practical exercises were built into each workshop, and participants were asked to use instructional materials, course content, and specific behavior problems from their own work environments and experiences. The intent of these requirements was to move each teacher toward the operation of an individualized classroom.

The motivation and control techniques to be acquired by the teachers from the several workshop experiences would, although seemingly unrelated, actually constitute a set of closely interrelated procedures. The goal was to enable each teacher to implement each of the techniques—instructional objectives, learning modules, and contingency management—in his class in the coming school year.

RATIONALE AND CONTENT OF THE WORKSHOPS

A rationale for each workshop is presented below.

Workshop on Instructional Objectives

The need for instruction in this area is based upon the premise that, although teachers customarily attempt to express the goals of their instruction, they often do not state these goals in explicit and unambiguous terms. For example, they often phrase such goals in terms of the instructional content, or in terms of the behavior engaged in by the teacher. Seldom are the goals of instruction stated in terms of what the *student* must learn to do. Today the consensus among those engaged in research on learning is that better teaching and better learning result when goals are stated in terms of student performance.

Use of clearly formulated statements of *behavioral* goals of instruction is desirable on several grounds:

(1) Such statements communicate instructional content and instructional outcomes more accurately and explicitly than do other means of stating class goals. Thus, communication is facilitated between teacher and students, teacher and aides, or teacher and administrator.

(2) They foster preparation of relevant and necessary instructional experiences for students. When goals are clearly stated, it is easier to decide what instruction is relevant and what is irrelevant.

(3) They provide a sound basis for the organization and construction of tests. Without explicit objectives, meaningful and valid test items cannot be formulated.

(4) They tend to ensure consistency in achievement from teacher to teacher or from teacher to aide.

Workshop on Learning Modules and Mastery Tests

Administrative requirements with regard to organizing and presenting instruction are frequently not compatible with the student's needs, expectations, and capabilities. Because teachers are confronted with the need to "cover" a stated amount of material in a given period of time, there is often a tendency to present instruction faster or in greater chunks than some students can effectively assimilate it. While the student is still struggling to accomplish one segment of material, and before he has demonstrated mastery of it, new material may be introduced and he may never have an opportunity to acquire the missing knowledge and skills. The result is that the student gets farther and farther behind, and increasingly frustrated with "the system."

An approach to this problem that has enjoyed some success is one in which the total amount of material to be learned in a semester or in a year is divided into more manageable segments called units or "learning modules." Associated with each module is an objective or set of objectives, and a corresponding criterion or mastery test. The task for the student in learning the material is to undertake it module by module, advancing to a new module only after he has satisfactorily accomplished the preceding one.

This procedure tends to foster more positive attitudes in the student toward the subject matter to be learned, partly because he now has greater control over the rate at which material must be learned. Some other benefits that accrue from the division of instructional content into learning modules are as follows:

(1) They provide a controllable instance in which desired student behavior—that is, learning—may be appropriately reinforced. Successful accomplishment of a module, in other words, sets up a situation in which the teacher may reward the student.
(2) The use of modules gives the student timely feedback about his progress in mastering the material to be learned. He knows how well and how fast he is progressing, and he knows what is yet to be accomplished.
(3) The use of modules also tends to reduce the number of opportunities in which the student might experience failure. The student is not permitted to attempt new instructional material until he has demonstrated satisfactory performance in earlier material.
(4) Modules tend to reduce interference in learning by beginning training on one behavior only after the preceding ones have been fairly well established.

Workshop on Contingency Management (CM)

The way the teacher interacts with and responds to the student—whether or not the teacher realizes it—plays a significant role in the attitude of the student toward learning and in his level of performance in the classroom. For example, the relative effectiveness of a classroom, the extent to which students engage in positive learning activities, and the amount of disruptive behavior that occurs are all reflections of the extent of the teacher's classroom control.

Educational literature amply supports the contention that the teacher can modify and control the performance of the students, both academic and disciplinary, by controlling his own responses (2). This finding holds across all sorts of teacher personalities, and for all sorts of student problems. With systematic training, any teacher can come to control his own behavior in ways that will improve the performance of the children being taught.

The approach by which to institute such classroom control—termed "contingency management"—has been found to be an effective means for facilitating appropriate human behavior. Its premise, derived from operant conditioning research, is quite simple: The likelihood of a given behavior depends on its consequence. Behaviors that are followed by satisfying or rewarding events are more likely to recur than behaviors that are followed by unsatisfactory or nonrewarding events. If the kinds of stimuli that are rewarding or reinforcing to a student are known, by observation, then the reinforcer should be presented if the desired behavior by the student appears. For example, if candy is known to be a reinforcer for a student, then it can be used to increase the likelihood he will perform a certain way; the candy becomes a tool by which to control (reinforce) specific student behavior.

The nature of stimuli that can be reinforcing varies widely. Under certain circumstances any of the following may serve as reinforcers: money, toys, food, free time, teacher attention, teacher praise, academic recognition, and so on.

It has become quite common to use simple tokens (e.g., "points") as reinforcers. Because of the demonstrated effectiveness of tokens for maintaining and motivating academic behavior, many writers speak of a "token economy." To help control and motivate student performance, the teacher and the student may enter into a contingency contract. The teacher informs the student that a given reinforcer will be awarded when he displays appropriate behavior—correctly pronounces a given word, constructs a

sentence, stays in his seat a fixed period of time, works an addition problem, or performs some other academic task. For such behavior the student may accumulate tokens or points, exchanging them at a later time for a desired reward.

A distinction was made between general CM procedures and formal CM programs. The general procedures consist of positively reinforcing (i.e., approval, praise, and success in learning) appropriate behaviors, extinguishing (i.e., ignoring) inappropriate behaviors, and minimizing aversive conditions (including the use of punishment), in the learning environment. A formal CM program consists of a functional analysis of explicit behaviors in the learning environment and the specification and implementation of a behavioral strategy for modifying the frequency of such behaviors. Formal programs may vary from simple two-week programs for shaping one behavior of one child to complex token economies extending throughout the year and concerned with many different behaviors of all the children in an entire class.

CONDUCT OF THE WORKSHOPS

Each workshop participant received a copy of a special workbook prepared by HumRRO. This workbook stated the objectives for each workshop, presented a schedule of activities, and gave definitions of workshop terms. It also contained four sample programs in contingency management, providing detailed instructions to the teachers. Using the programs as guides, each teacher could prepare procedures for modifying designated student behavior.

The workshops extended over a period of four weeks in the summer of 1970 and four weeks in the summer of 1971. A total of 24 teachers attended the first workshop and 25 attended the second. The contingency management workshop was scheduled in conjunction with instruction of selected students from the River Rouge School District. The teachers were arranged in pairs and each pair was assigned to a class of approximately 10 to 15 students. Each teacher pair provided its class with two hours of instruction in reading and mathematics each day. Members of the research team visited each classroom daily and provided each teacher with feedback regarding his application of contingency management techniques in the classroom.

A substantial portion of the instructional objectives workshops was spent in deriving or selecting and modifying objectives for use during the regular school year. A set of terminal objectives was developed during the first summer for K-3. This set was refined and expanded to K-7 during the second summer.

The objectives developed during the summer workshops provided the River Rouge School District with an integrated set of learning criteria. Ideally, these criteria should have provided the basis for evaluating the effects of the program on student achievement. However, other considerations led to the selection of commercial standardized tests for assessing student achievement. Not all the performances required on the test were included in the set of objectives developed in the summer workshops. Hence, it became necessary to augment this set of objectives with objectives that did specify the performances required by the standardized tests. Only in this way could instruction and evaluation be directed positively toward at least some of the same objectives. The augmentation of these objectives is discussed later in this report.

THE FOLLOW-ON PROGRAM

During the school year following each summer workshop, a follow-on program was conducted in which the primary goal was to increase the probability of successful

attempts by teachers to implement the techniques and procedures they had learned in the summer workshops in their regular classes. One premise of the follow-on program was that making a verbal or written commitment to perform specific activities would increase the probability that a person would indeed perform such activities. An attempt was made to get each teacher to make a formal commitment to implement the use of behavioral objectives and contingency management in his instructional procedures; making such a commitment would assure the teacher of administrative support for change activities.

The overall approach to the follow-on program involved group and individual meetings with teachers with periodic observation of teacher classroom behavior. Support for the teachers was provided by the school district administration and by a team of HumRRO observers. The Director of State and Federal Projects in the River Rouge School District was appointed the Program Coordinator for the follow-on program. It was his responsibility to conduct the meetings with teachers and to observe the teachers periodically in the classroom and provide detailed and immediate feedback on their performance. He was to be constantly available to the teachers to help solve any problem that might arise. During the second year, he was joined in some of these activities by the District's Curriculum Coordinator.

To help teachers and the program coordinator, a set of teacher performance objectives was prepared and distributed during the second follow-on program. A copy of these objectives is given in Appendix A. In a parallel fashion, a set of program coordinator performance objectives was also generated. A copy of these objectives is given in Appendix B.

The initial phase of the follow-on program involved observation of the classroom behavior of students by teachers for the first five to six weeks of each school year. During this period, teachers were initially to identify behavior problems that disrupted or prevented the establishment of a desirable learning environment. However, some teachers immediately began using contingency management procedures with their classes. A few teachers began the year by using the list of objectives generated during the summer workshop to identify the performance levels of the students coming into their classes. Thus, implementation of the procedures learned during the summer workshops actually began before anticipated in these few cases.

The Program Coordinator held several meetings with the teachers during each school year. The HumRRO team made five trips to River Rouge the first year and three the following year and were present for many of these meetings. During these meetings, problems encountered by teachers in implementing contingency management techniques and in using behavioral objectives in the classroom were discussed. Solutions were arrived at either through group discussion or through suggestions from HumRRO research personnel. Contingency management programs were also developed and designed for individual teachers who had specific behavior problems in their classrooms. These rather informal meetings were also used for providing feedback to the teachers regarding technical errors made in implementing CM procedures and techniques, and for providing positive reinforcement of appropriate teacher behavior.

Throughout each year, the Program Coordinator gathered information and prepared reports of the activities of program teachers. He selected exemplary programs developed and applied by some of the teachers in their classrooms for publication in a special newspaper, *The Bugle*, concerned only with activities in the program. In this way, he was able to reinforce successful teachers with public recognition and designate model programs that other teachers might emulate.

METHOD

ACHIEVEMENT EVALUATION

The procedures for evaluating the effects of the program on student achievement were largely determined by the requirements of the funding agency during the second year of the program. Funds for the second year were obtained by the District under Section 3 of the Michigan School Aid Act. Such fund allocations are administered by the Michigan Department of Education.

Programs funded under Section 3 of the Michigan School Aid Act had to be targeted toward students who were one or more years below grade level in either reading or mathematics.[1] Furthermore, it was specified that the level of funding available for the next year would depend upon the achievement gains attained by these targeted students during the current year. In order to receive full funding for the following year, target students are required to gain .75 grade level in the preceding ten-month school year as determined by pretesting and posttesting with an approved standardized achievement test. If the period between the pretest and posttest is not a full ten months, then the minimum acceptable gain can be prorated from the ten-month requirement.

Target students were selected only from the classes of program teachers, since the funds were used to support activities in which only they participated. The results of the pretest were not available to the program teachers at the time when they had to select their target students. Hence, they had to rely on the results of tests given in previous years and on their own judgment.[2] The number of target students in each program teacher's class varied from four to 14, with an average of almost 11 per class. As will be discussed later, there were 31 program teachers at this time.

Although the testing effort was undertaken to determine the achievement gains of the target students, it was extended to include all students. In this way, it was possible to compare the gains of target students with the gains of other students in the District as a means of determining the relative effectiveness of the program teachers.

The Michigan Department of Education designated a number of commercially available standardized achievement tests from which each district might choose. The River Rouge School District chose the Stanford Early School Achievement Test, Level I, for measuring the gain of kindergarten and first grade students and the California Achievement Test (1970 Edition), Forms A and B, for measuring the gains of second through seventh grade students.

The pretests were administered in October 1971 and the posttests were administered in May 1972. The intervening period was seven months, yielding a prorated minimum gain requirement for target students of .525 years.

AUGMENTATION OF THE INSTRUCTIONAL OBJECTIVES WITH TEST OBJECTIVES

Although the program teachers had developed behavioral objectives for their own classes during and following each summer workshop, there was no assurance of complete

[1] Students of seventh grade teachers who participated were funded under a different program.

[2] An inspection of pretest scores shows that teachers were remarkably accurate in selecting as target students those who scored in the lower half of the class.

overlap between the teacher-made objectives and the objectives reflected in the standardized tests. Standardized tests must necessarily measure achievement in meeting a broad cross section of instructional objectives from curricula throughout the nation. Hence, the objectives might be more or less encompassing than those in any locally accepted curriculum. However, since the tests constituted the criterion of success, it was felt that the test objectives should be available to the teachers. An attempt was made to secure such objectives from McGraw-Hill, publisher of the California Achievement Tests (CAT). They replied that the CAT was based on curricular content sampling rather than on behavioral objectives.

Since behavioral objectives were not available for the CAT, objectives for reading were constructed by the authors by inferring them from the items on one form of the test. No objectives were constructed for mathematics. It was found that the objectives inferred from one form of the test specified the items on both forms equally well. Sample items like those on the forms of the test were also developed for each of the inferred behavioral objectives in reading.

A three-hour group session was held for the program teachers. At this meeting, the research team went over the development of the test objectives and sample test items in reading. It was explained that these objectives were developed specifically to avoid "teaching the test." The test objectives provided a generic substitute for the test itself.[1] The group discussed ways in which these materials could be used, including:

(1) As a means of specifying achievement deficiencies in individual students as determined from the pretest.
(2) As a means of evaluating individual student progress toward eradicating achievement deficiencies.
(3) As a basis for selecting or developing practice materials for students.
(4) As a means of familiarizing students with test-taking procedures.

The program teachers were also urged to make up additional sample test items from the objectives and exchange them among themselves. In this way, no one teacher would be burdened with too great a load in making up sample items. The teachers were also encouraged to make up mathematics items in the same format as used in the CAT. However, since the CAT was not available to them and no mathematics objectives had been prepared for it, they could not make up items that directly paralleled the content of the test.

The extent to which program teachers actually used these materials was neither controlled nor even determined. Informal reports to the Program Coordinator indicate that at least some of the teachers used them in at least one of the ways discussed at the meeting.

QUESTIONNAIRES

Questionnaires were administered to the program teachers and their principals at the end of the school year regarding their use of the classroom practices stressed by the program and their recommendations for continuing aspects of the program.

[1] Sample test objectives developed in this effort are presented in Appendix C. Also included for comparison purposes are some teacher-made instructional objectives and associated test items.

RESULTS

Since several of the program teachers were dissociated from the program effort prior to the end of the study, it is necessary to account for each teacher before presenting the results, whether quantitative or other.

Of the 24 teachers who attended the 1970 series of workshops, four asked to be dropped from the program after one year, three left after one year because of pregnancy, one left after a year and a half because of illness, and one was transferred from one school in the River Rouge District to another school. Thus, these teachers are not represented in any of the quantitative results to be presented. In addition, one other teacher, although she remained in the program, is not represented in the quantitative results because she taught remedial reading. Thus, this evaluation contains 14 teachers.

Of the 25 teachers in the 1971 program, three taught remedial reading or special education, three taught high school classes, and two asked to be dropped from the program after the summer workshop. Data from these teachers are also not included in the quantitative results. In summary, then, there were 31 teachers for whom student achievement data were available—14 from the 1970 workshop and 17 from 1971. Of these teachers, 23 taught grades 2-7 while 8 taught grades K-1.

STUDENT ACHIEVEMENT

Grades 2-7

In examining the effects of the inservice training, the primary area of interest was student achievement. Of particular interest, of course, was the amount of achievement gain displayed by target students. The achievement test results for target students are given in Table 1. Because the number of students who took the pretest and posttest varied slightly for reading and mathematics, the number for each content area is given.

Table 1 shows that the average gain in Grade Equivalent score for all target students was 1.02 for reading and 1.08 for mathematics. The target students, therefore, readily exceeded the gains sought by the District.

Table 1

Mean Gain in Grade Equivalent (G.E.) Scores for Target Students

Grade	Number of Teachers	Reading		Mathematics	
		Number of Students	Mean Gain in G.E.	Number of Students	Mean Gain in G.E.
2	5	59	.99	61	.74
3	6	76	1.14	75	1.46
4	3	33	.87	33	.98
5	3	28	1.19	28	1.21
6	5	45	.74	45	1.07
7	2	21	1.13	20	.74
Total or Mean	24[a]	262	1.02	262	1.08

[a]One teacher taught a fifth and a sixth grade class and is thus represented twice in the data.

To determine whether gains of target students were obtained at the expense of non-target students, a comparison was made between the average gains for these two groups. The following procedure was used. First, it was assumed that the average gain shown by all target students in a class could be viewed as a *teacher score*. Furthermore, since each program teacher had both target and non-target students, a teacher score was possible for both groups of students. Thus, two distributions of teacher scores were possible, one for target students and one for non-target students. To compare the means of these two distributions, a t test was calculated. The results of this test are shown in Table 2.

Table 2

Comparison of Performance of Target and Non-Target Students of Program Teachers in Terms of Mean Gain Scores

Group	N	Reading		Mathematics	
		Mean Gain Score	SD	Mean Gain Score	SD
Target	24	1.02	.361	1.08	.445
Non-Target[a]	24	1.21	.364	1.32	.552
		$t = 1.23$		$t = 1.09$	

[a]Values here are based on a total of 289 non-target students.

With 46 degrees of freedom, neither of these t values was significant. In other words, although there was a tendency for non-target students to show a greater mean gain, this gain was not statistically significant. Among other things, this means that, in instances where it would be useful, one may combine scores of target and non-target students of program teachers.

To determine whether the gains of program teachers (target and non-target students combined) were greater than those which might have been expected had teachers not received special inservice training, a comparison was made with gains shown by students in classes taught by non-program teachers. In selecting classes of non-program teachers certain limitations seemed justifiable. For example, classes of teachers who participated initially in the program but who later dropped out were not included. Also, classes in which the teacher changed during the school year (i.e., a new teacher took over the class) were excluded. Finally, classes in which the student body did not remain relatively constant were also excluded. Using these criteria, some 34 classes (grades 2-7) were found suitable for comparison purposes.

To obtain meaningful measures of gain for non-program classes (or non-program teachers), it was first necessary to delete scores of all students who did not take both pretest and posttest. Once this was done, pretest and posttest means were calculated for each class. Then, substracting the mean pretest score from the mean posttest score, a distribution of mean gain scores was produced. The mean of this distribution was compared with the mean of classes of all program teachers. A description of non-program classes in terms of numbers of students and teachers is shown in Table 3.

To compare the mean gain in achievement of program teachers with non-program teachers, a simple t test was employed. The scores of the 24 program teachers were based

Table 3

Description of Classes of Non-Program Teachers

Grade	Number of Teachers	Number of Students With Pretest and Posttest Scores
2	6	125
3	4	96
4	7	161
5	7	165
6	8	174
7	2	60
Total	34	781

on the performance of 551 students (262 target, 289 non-target). The results of this test for both reading and mathematics are shown in Table 4.

Table 4

Comparison of Performance of Program and Non-Program Teachers in Terms of Mean Gain Scores

Group	N	Reading		Mathematics	
		Mean Gain Score	SD	Mean Gain Score	SD
Program	24	1.11	.325	1.20	.449
Non-Program	34	.55	.461	.63	.435
		$t = 5.09$ $p<.001$		$t = 4.83$ $p<.001$	

This table shows that each t was highly significant, that is, that the mean gain score of program teachers was much greater than that of non-program teachers in both reading and mathematics. Or, more correctly, the students of program teachers made significantly greater gains in achievement than did students of non-program teachers.

Since gain scores are sometimes viewed with suspicion (3, 4), especially when pretest levels of groups differ widely, the mean pretest scores for each grade level for program and non-program classes were calculated. Table 5 shows the results of these calculations.

Examination of this table shows that, in the 12 comparisons reported, program classes had higher pretest means in only three instances. These were in grade five (reading and mathematics) and in grade six (mathematics). In all other instances, program classes had slightly lower pretest means. Because the differences were so small, no statistical tests were performed.

Table 5

Mean Pretest Scores of Program and Non-Program Classes

Grade	Reading		Mathematics	
	Program	Non-Program	Program	Non-Program
2	1.84	2.01	2.02	2.17
3	2.39	2.69	2.71	2.73
4	3.80	3.92	3.88	3.95
5	4.91	4.53	4.58	4.23
6	5.05	5.10	5.25	5.23
7	6.39	6.57	5.95	6.37

Grades K-1

As noted earlier, all kindergarten and first grade students were administered the Stanford Early School Achievement Test. Results from this test are reported in raw scores rather than in grade equivalent scores. Table 6 shows the mean raw gain scores for target and non-target students of all program teachers. Scores for the two subgroups were combined at the start.

Table 6

Mean Gain in Raw Scores for K-1 Target and Non-Target Students of Program Teachers

Grade	Number of Teachers	Reading		Mathematics	
		Number of Students	Mean Gain	Number of Students	Mean Gain
K	1	41	8.5	41	5.8
Pre-Primary	1	10	10.7	10	9.6
1	6	128	5.1	128	4.2

To evaluate these gains, an attempt was made to find comparable classes taught by non-program teachers. Using the same criteria of selection as with Grades 2-7, only a few classes could be identified. The data from these classes are presented in Table 7.

Table 7

Mean Gain in Raw Scores for K-1 Students Taught by Non-Program Teachers

Grade	Number of Teachers	Reading		Mathematics	
		Number of Students	Mean Gain	Number of Students	Mean Gain
K	3	67	8.2	67	6.8
Pre-Primary	1	9	7.8	9	5.3
1	4	75	3.9	75	2.9

A comparison of the two tables shows that the students of program teachers gained slightly more than students of non-program teachers in all but one instance (mathematics at kindergarten level). Because the differences tended to be small and because so few non-program classes could be found, no statistical tests were made of the differences.

TEACHER REACTIONS

To obtain some feedback from program teachers regarding their use of instructional objectives, efforts at individualizing instruction, preferred reinforcement management technique, and so forth, a special questionnaire was devised and administered in May 1972. A total of 35 teachers completed the questionnaire.

For convenience the questionnaire is used to report the teachers' responses to the items in Appendix D. The questionnaire shows tallies indicating how the teachers' answers were distributed on the various questions.

In general, responses of teachers indicated that, while they were far from unanimous with respect to the use of particular objectives, the majority of teachers (65% or more) used objectives rather extensively either as guides to preparing lesson plans or as aids in evaluating student progress.

All but one of the 35 teachers indicated they had attempted to individualize instruction. Nearly all (85%) these teachers used commercially available teaching materials as well as their own materials in their individualization efforts. Most teachers selected reading and arithmetic as the content areas in which to attempt individualization. Approximately 75% of the teachers felt that they were at least "fairly successful" in their efforts.

With respect to use of positive reinforcement practices, some 80% of the teachers acknowledged that their use of such practices had increased at least a moderate amount. What teachers viewed as most effective disciplinary practices, however, varied widely. Many subscribed to a point or token reward system. Others preferred verbal praise, ignoring students, giving special rewards, applying group pressures, providing academic success, ensuring a threat-free class, using a reinforcement menu, and so forth. At the same time, some felt that withholding rewards or using some form of punishment was most effective. In summary, then, the full range of positive and negative reinforcement techniques appeared to have been used.

With respect to possible changes in the program, 40% either felt no change was necessary or had no comment to make. Other teachers suggested the merit of obtaining more teaching materials for the instructor, providing each teacher with more help and supervision, reducing the amount of formal paper work, and arranging more frequent meetings of program teachers.

Finally, only a scattering of teachers offered any "gripes" about the program. Most were complimentary toward the program coordinator and toward the program itself. One or two teachers wanted more classroom observations by the coordinator, less paper work, and more help in individualizing instruction.

ADMINISTRATOR REACTIONS

To obtain reactions of school administrators to the program a brief questionnaire was constructed (Appendix E). The questionnaire was administered to the four elementary school principals, the administrators most directly concerned with the possible impact of the program. Responses of principals to the questionnaire are provided on the questionnaire in Appendix E.

By their responses, the principals indicated a general awareness and approval of what the teachers were doing, viewed teacher and community attitudes toward the program as favorable, and recommended that the help provided to schools in their efforts to improve instruction be continued. In light of these reactions, it is somewhat startling to note that no principal recommended that funds for reinforcers be continued. (See last item on question VI.)

DISCUSSION

At the time the inservice training program was initiated, there was no expectation that rigorous evaluations and comparisons with non-program teachers would be involved. The matter of prime interest was the effect of special training activities on the classroom behavior of program teachers. This included, of course, the academic performance of students, but at this time there was no attempt made to match teachers, students, classes, or schools. Such an approach would have entailed a rather complicated and costly design, which would not be justified as being in consonance with the District's pragmatic goals. The object was to effect change with proven processes rather than conduct research.

Later, when it was known that the amount of future funding to school districts would be directly tied to achievement of students, a special interest in student achievement ensued. It was at this time, then, that preliminary thoughts were given to procedures by which performance of program teachers might be compared with non-program teachers. It should be clear, in other words, that the study reported here was never viewed as an experiment in which program teachers served as experimental subjects and non-program teachers served as control subjects.

The paragraphs above are intended to provide some justification for the comparison procedures that were used. It is acknowledged that they may not have been optimal. Program teachers, for example, were all volunteers; teachers were not randomly assigned to program or non-program groups. One might question, then, whether program teachers—being all volunteers—might not simply have been better teachers at the start.[1] Furthermore, systematic observations were not made of non-program teachers nor were they provided with all the supplementary resources given program teachers. Despite these and other matters, however, a concerted effort was made to identify unbiased non-program classes (teachers) so that meaningful comparisons in achievement could be made with program classes (teachers). With regard to achievement, the results were clear.

Without question, the most striking finding reported in the results was the sharp gain in achievement (grades 2-7) shown by students of program teachers compared with students of non-program teachers. The finding would seem to leave little doubt about the effects of the training and assistance that were provided to program teachers. As was shown in Table 4, the mean achievement gain for program classes was twice that of non-program classes for reading, and almost that much for mathematics. Even with all the limitations and shortcomings sometimes leveled against gain scores, this difference has obvious practical significance. The fact that pretest means of program classes were, in 9 of 12 instances, smaller than non-program classes lends even more weight to the conclusion that the gains were real.

Why similar differences in achievement gains were not found in K-1 grades is not known. Perhaps achievement tests at these levels are not sufficiently sensitive to instruction, or perhaps test scores at these levels are not as reliable as might be desired,

[1] The Program Coordinator's personal opinion was that the program teachers as a group were representative of the teachers in the system.

or perhaps there were simply no treatment effects. This might be an area for special inquiry in future efforts of this type.

In seeking to identify specific aspects of the training program that may have been most influential in producing the grades 2-7 results, one can only offer certain speculations. As might be surmised, no effort was made at the start of the study to provide means by which the effects of program aspects could be statistically isolated. There appeared to be no need for such sophistication as it was an action program, not an experimental research effort.

The following several groups of factors need to be examined in any attempt to identify the source of the achievement gains.

Instructional processes

(1) Behavioral objectives

Teacher development and application of grade level instructional objectives.

Teacher development and application of achievement test objectives and sample items.

(2) Contingency management

Teacher application of general contingency management procedures.

Teacher application of formal contingency management programs.

(3) Mastery learning

Teacher aides

Motivational and guidance resources provided to the teachers

(1) Group meetings

(2) Coordinator visitations, feedback, guidance, and approval

The questionnaire responses tabulated in Appendix D indicate that the great majority of the program teachers used instructional objectives both to guide their preparation of lesson plans and to check-off pupil progress. Although there are no questions directly concerned with mastery learning, checking off pupil progress against objectives is certainly an approach toward mastery requirements. In learning how to select and write objectives, perhaps the most important result was that teachers came to use more useful practices—at least from the student's viewpoint. In other words, regardless of the origin of objectives (workshop, textbook, teacher, or test), the fact that objectives tended to be used more often than in the past suggests that the focus of teachers came to be more on the behavioral demonstration of achievement by individual students than on the presentation of instructional content. The program teachers may have become more interested in what students can do now and what they should be able to do in the future than in how many paragraphs, chapters, or books had been *completed*.

A somewhat similar interpretation might be made about the use of contingency management techniques. As indicated in Appendix D, all but two teachers acknowledged that their use of positive reinforcement practices had increased over the past year. By definition, then, the amount of student-teacher interaction also increased. Thus, from the student's point of view, teachers were effective because they employed practices conducive to learning. A large number of teachers indicated that they used formal contingency management programs in their classes, and observations of teachers in the classroom clearly substantiated the widespread use of "general reinforcement" strategies. The program teachers became more interested in modifying the frequency of occurrence of specific disciplinary and motivational behaviors of individual students instead of simply categorizing them as "motivated," or "unmotivated," or "unruly." Changing student behavior became more important than simply accounting for it. And they now possessed the conceptual tools for effecting such change.

The instructional processes used in the classroom by the program teachers clearly became more behavioral (and, hence, more specific) and more individualized with regard to student achievement and to student motivation and discipline. The interactions between students and their teacher became determined by the students' behavior more than by the superficialities of instruction: That is, covering content and categorizing problem children.

The assignment of teacher aides to program teachers cannot be dismissed lightly. The fact that more program teachers recommended the continuation of teacher aides (item 13, Appendix D) than any other aspect of the program testifies to the importance of the aides. Observations in the classrooms by the program coordinator and research staff confirm the criticality of the aide to the operation of many formal CM programs. It is doubtful whether any but the most simple token economies could be operated without the help of an aide. In many instances, the aide relieved the teacher for instructional activities by preparing materials, keeping records, supervising practice and study, and managing the comings and goings of students. The use of teacher aides physically facilitated the program teachers' shift toward instructional processes that are individualized, and behaviorally determined.

The responses to item 13 in Appendix D indicated that the three aspects of the program valued by the most teachers were all tangibles: teacher aides, funds for reinforcers, and help in individualizing instruction.[1] The last of these three entries refers to help in obtaining and learning to use commercially prepared individualized instructional materials rather than help in developing their own methods and materials. It became apparent during the course of the program that teachers simply do not have the time or broad capability to undertake the development of complete sets of individualized materials. However, they can modify and supplement commercial materials to fit local conditions and needs.

The fourth most valued aspect of the program was guidance in using CM. This is the highest valued non-tangible aspect of the program. Because of its high value among the program teachers, the River Rouge School District would be advised to consider maintaining and extending this function as a permanent teacher resource.

The remaining entries in item 13 do not clearly differentiate between motivational and guidance resources provided to the teachers. Although only a moderate number of teachers recommended their continuation, in aggregate they suggest some modest requirement for group involvement and recognition.

While one cannot separate the effects of the follow-on program from the other factors, it seems reasonable to ascribe a large portion of the findings to this aspect. The workshops were instrumental in giving teachers basic knowledge and practice in using objectives and contingency management techniques, but it is debatable how well teachers would have been able to implement the practices in their classrooms without the special assistance and guidance provided by the program coordinator and HumRRO researchers. The readiness with which most teachers joined in group discussions of problems, their eagerness to get ideas for problems confronting them, and the frequency with which they sought external help in the management of their classes support the contention that the follow-on program provided the kind of help they needed.

One might reasonably have expected that the target students would have benefited more from the program because of the performance contracting feature of the funding arrangement that existed during most of the evaluation year. This arrangement provided incentive for gains made only by target students. Hence, it is natural to expect that

[1] Funds for reinforcers were made available directly to teachers. This may account for the lack of interest in such funds by principals (Item VI, Administrator Questionnaire).

teachers would make special efforts to help such students. While the results make clear that teachers did help target students, there is also evidence that equal help was provided to non-target students. Since this incentive failed to have a differential effect, it is questionable whether it operated as an incentive at all.[1] A performance contract also existed between the teacher and the program coordinator which specified the responsibilities of each. A copy of this contract is given in Appendix F. It seems more likely that this contract established the effective incentives.

Compared to other teachers, the program teachers as a group were probably more attentive to the achievement deficiencies of each child, more certain as to how to proceed with each child, less aversive and punitive and more approving of each child's learning activities, and less likely to abrogate responsibility for solving a child's learning or motivational problems in the face of initial failure. They had advisory resources available to and used by them in the form of the program coordinator, fellow teachers, and outside consultants. Professional communication among the program teachers was enhanced by the program coordinator, by frequent group meetings, by an in-group newspaper, and by the common set of concepts and words learned to describe classroom processes. The net effect of these practices was to replace the traditional solitary teacher, who dispenses information, uncertain of his motivational and disciplinary practices, alone and unnoticed in his classroom (5), with a teacher who effects significant behavioral changes in each child, effectively analyzes and deals with behavioral situations, and functions harmoniously as a member of a group with shared responsibilities for student learning and conduct.

[1] If the contract arrangement failed to operate as an incentive with regard to student gains, then it becomes a matter of interest to determine whether such an arrangement has any effect at all. The River Rouge program was already underway when this contract arrangement was instituted, hence the arrangement could not have affected program planning. But in instances in which plans have not yet been formulated, it seems reasonable to speculate that such an arrangement may encourage the development of low-risk plans; that is, a school district may choose to remain with a program that they know will provide adequate funding rather than experiment with other programs that may fail. The performance contract arrangement in funding may discourage innovative educational programs.

LITERATURE CITED
AND
APPENDICES

LITERATURE CITED

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Appendix A

TEACHER PERFORMANCE OBJECTIVES

The following teacher performance objectives were prepared to assist teachers and the program coordinator of the River Rouge School District in the implementation of the "HumRRO Project." The objectives were prepared to provide a comprehensive description of desired teacher performance. The prime purpose of the objectives is to furnish guidance to teachers with respect to the accomplishment of their jobs. The second purpose is to aid the program coordinator in his efforts to monitor and give assistance to teachers.

The objectives should be viewed as tentative. As teachers attempt to follow them and the program coordinator attempts to use them in his monitoring efforts, certain omissions or other inadequcies may be revealed. Thus, the objectives given here should be viewed as subject to change. In fact, users of the objectives are encouraged to submit their comments and evaluations.

The objectives depict four main types of teacher functions. These functions are:

I. Develop and implement training practices which maximize student acquisition of knowledge for which the teacher is responsible.

II. Design and implement practices that strengthen those student behaviors that facilitate learning and weaken those student behaviors that interfere with learning.

III. Plan for and implement a program of professional growth for self and other teachers.

IV. Examine and plan for a test of innovative practices in the classroom.

I. Develop and implement training practices which maximize student acquisition of performance capabilities for which the teacher is responsible.

A. Identify terminal instructional objectives in behavioral terms. It is certainly possible and perhaps desirable that not all teachers do all the things necessary to identify the terminal instructional objectives, but rather that the teachers who teach a given subject matter at a given grade level divide the work among themselves. When this occurs, the program coordinator should insure that the group operates effectively and that assignments are accepted and understood.

1. The teachers should prepare a list of tentative terminal objectives from each of the following requirements:

a. The educational performances that will be required of the students in the next grade of school as determined from the following sources:

(1) The textbooks and classroom tests for the next grade.

(2) Discussions with teachers of the next grade.

(3) Standardized achievement tests administered to students during the next year, if any.

b. The capabilities expected of students during the present grade of school as determined for the following sources:

(1) The textbooks for this subject matter and grade.

(2) Discussions with other teachers of the same subject matter and grade.

(3) Expectations of the school administration and community as indicated by school policies.

2. The teachers should prepare a list of final terminal objectives that are coordinated with the terminal objectives for the appropriate subject matters in both the preceding and subsequent grades. Particular emphasis should be placed upon attaining resolution of differences among the teachers at the three grade levels.

B. Identify enabling objectives for each terminal objective to the level of the minimally prepared student. The first step in the identification of enabling objectives is the preparation of a set of directions that are effective in eliciting performance of a behavioral act from minimally prepared students.

1. The teachers should prepare a draft set of directions for performing the behavioral acts specified by each objective at a level of detail and language believed to be appropriate for minimally prepared students. Initial effort should be placed on those objectives whose attainment has generally been most difficult.

2. The teachers should test the accuracy of the draft sets of directions by submitting them to each other for a performance review.

3. The teachers should test each set of directions with one minimally prepared student at a time and revise the directions on the basis of the outcome of the test until the directions are effective in eliciting proper performance from such students.

4. Formulate significant directions in each set as enabling objectives, paying particular attention to organized information to be stored in memory and perceptual-motor skills not possessed by minimally prepared students.

C. Arrange both terminal and enabling instructional objectives into appropriate groups and orders.

1. Arrange the terminal objectives into primary groups in terms of common enabling objectives; i.e., in terms of common information pools, common perceptual-motor skills, and similar sets of directions. This may be done most readily by arranging terminal objectives along one edge of a matrix, enabling objectives along the other edge, and placing "X"s in the appropriate squares. Primary groups of terminal objectives are those which share few, if any, enabling objectives with other groups. Further analysis of primary groups can be performed by different teachers so as to reduce the amount of work required from any one teacher.

2. Arrange the terminal objectives in each preliminary group in order of learning difficulty.

a. Make estimates about the learning difficulty of each enabling objective in the primary group: Easy, moderate, and difficult should be sufficient.

b. Select as the first terminal objective to be attained that one which subsumes the fewest, easiest, and most common enabling objectives and proceed in this manner until all enabling objectives have been placed in an order. It is not necessary to place each terminal objective into a precise point in the order, but only into order categories.

D. Implement effective learning activities for each objective in each primary group.

1. Identify each objective as being principally concerned with one of the following learning functions.

a. Information retrieval.

b. Perceptual-motor skill.

c. Complex performance.

2. Develop an instructional strategy for each objective. The overall goal is to maximize the number of effective learning responses emitted by each student during each class period. General requirements for strategies for each kind of learning function are as follows:

a. Strategies for information retrieval objectives should allow the student to practice in randomly presented information retrieval events with immediate feedback. Flashcards are an example. The student may also be provided with memory aids to prompt retrieval in some or all events. Preferably, memory aids should be on a demand schedule such that they are presented only at the student's request. This may require that students work in coach-pupil pairs in lieu of using special machines or devices.

b. Strategies for perceptual-motor skill objectives will vary depending upon the particular kind of skill involved. Regardless of the details of any particular strategy, all of them should provide each student with

many opportunities in which to practice the skill under conditions of prompting on demand and immediate feedback. Again, it may be most economical and effective to arrange students in coach-pupil pairs working with specially designed materials.

c. Strategies for complex performance objectives should provide the student with prompting on demand for each step or group of steps in the procedure. Directions for all except very short procedures should include a multi-level outline as a memory aid. In many instances, early learning can be concerned solely with acquisition of the verbal directions without actual practice of the performance. In this manner, the student can provide his own directions during later learning.

E. Implement appropriate learning management procedures. The overall goal is to maximize the number of effective learning responses emitted by each student during each class period. The amount of time students spend attending to presentations of information or recitations by other students, or doing things which they already do adequately well, or doing things which are well beyond their immediate capability should be reduced to a minimum. Again, different parts of the developmental work can be performed by different teachers so as to reduce the amount of work required from any one teacher.

1. The teachers should develop an evaluation system which assesses each student's entering capabilities and governs his progress through the instructional program.

   a. Prepare a number of test items for each objective, as appropriate.

   b. Assemble the items into at least two alternate test forms for each objective or group of objectives to be used for both placement and mastery progression evaluation.

   c. Assemble the remaining items into self-administered tests to be used by students in the instructional program to determine their own readiness for the next progression test.

2. The teachers should develop a record-keeping system which displays the following information about each student.

   a. His point of entry into each continuum of objectives as determined by placement tests.

   b. His attainment of objectives as determined by mastery progression tests.

   c. His present placement on each continuum of objectives.

   d. The objectives which he has not yet attained.

3. The teachers should develop or select instructional materials which, in so far as possible, are capable of being:

   a. Machine-administered,

   b. Peer-administered, or

   c. Self-administered.

4. Each teacher should detect and correct progression difficulties in instructional materials.

a. Progression difficulties are indicated when:

(1) A large number of students fail a progression mastery test on the first time through the instructional materials for that test.

(2) Some students, who fail on the first try, recycle again and again without significant improvement.

b. Diagnosis of the difficulty should be based on observation and on tutorial trials by the teacher with students who failed to learn.

c. Draft revisions should also be tested by means of tutorial trials with students who failed to learn with the original materials. Revisions should continue until satisfactory test results are obtained.

II. Design and implement practices which strengthen those student behaviors that facilitate learning and weaken those students behaviors that interfere with learning.

A. Implement a classroom environment that minimizes the occurrence of aversive stimulation.

1. Given a classroom situation typical of the teacher's experience, the teacher should list the possible aversive conditions that could exist in the classroom. Aversive conditions may result from teacher behavior, student behavior, or from some situation within the school system. The teacher may ask the students in her class to prepare a list of conditions that they think are aversive.

2. Given a list of aversive conditions that may exist in a classroom, the teacher should identify those that actually exist in her classroom. The teacher may seek the assistance of the program coordinator, the students, other teachers, etc. in identifying the conditions.

3. Given a list of aversive conditions that actually exist in her classroom, the teacher should, with the aid of students, prepare a set of classroom rules that will aid in minimizing aversive conditions. The teacher may also seek the assistance of the program coordinator in preparing classroom rules. The teacher should plan her instruction around aversive conditions that cannot be eliminated. In effect, the teacher would be minimizing the influence of such aversive conditions.

B. Implement a reinforcing environment in the classroom that will strengthen (or elicit) appropriate student learning behaviors.

1. Given the schedule of the academic program for the school year, the teacher will prepare a list of student activities, defined in behavioral terms, in each category of behavior that facilitates learning. Suggested general categories of behavior that facilitate learning are:

a. Orientation, which involves getting students in contact with instructional materials and keeping them in contact for sufficient periods of time. The term instructional materials includes verbal as well as printed materials;

b. Attending, which refers to students' presence in the classroom or attendance at special school activities;

c. Lesson completion, which refers to the completion of assigned school work, either in the classroom or away from the classroom;

d. Non-interference behavior, which includes behavior that does not interfere with another student's learning activities. This may include the absence of certain behaviors such as fighting or other aggressive behaviors.

2. Given the list of student behaviors that facilitate learning, the teacher will implement the general contingency management procedures to elicit and maintain such behaviors. In using the general CM procedures, the teacher will use social reinforcement (approval, praise, success in learning) and will ignore inappropriate behaviors that are not harmful to the student exhibiting the behavior or to others. When reinforcing students, the teacher should minimize inadvertent reinforcement of inappropriate behavior.

C. Design and implement a monitoring system to be used in identifying students that do not respond to the general CM procedures with appropriate learning behaviors.

1. Given a classroom environment that reinforces appropriate learning behaviors, the teacher should maintain a general observation of student behavior for the purpose of identifying inappropriate individual or group behaviors that persist.

2. Given an indication of the need of a formal CM program, the teacher will develop techniques for formal observation of individual or group behaviors. A behavioral statement of the inappropriate behavior should be prepared by the teacher. An observation schedule should be prepared providing for specific periods of observing and recording the occurrence of the inappropriate behaviors. Record forms must be modified or developed for data recording during the observation periods.

3. Given the schedule for observing a specific inappropriate behavior and a set of record forms, the teacher (or teacher aide) will observe and record the occurrence of the inappropriate behavior for five to ten days. At the end of the observation schedule, the teacher will summarize the recorded data and determine if the inappropriate behavior occurs often enough to present a real problem (interferes with the learning process).

4. Given data to indicate that a specific inappropriate behavior presents a problem, the teacher will conduct a behavior analysis to identify the aspect of the environment that is maintaining the inappropriate behavior. This task will result in the decision that there is or is not a need for a formal CM program for changing the behavior.

D. Develop and implement a formal CM program for strengthening appropriate learning behaviors and extinguishing inappropriate learning behaviors.

1. Given a behavioral statement of an inappropriate behavior to be eliminated, an appropriate behavior to be elicited and strengthened, and the environmental element that is maintaining the inappropriate behavior, the teacher will prepare a statement of a strategy to be used for modifying the behavior. The complete statement of the strategy will include:

a. A list of reinforcers developed in consultation with the student(s), principal, project coordinator, and parents, if necessary.

b. A set of instructions to be given to the student(s) and class as an explanation of the CM program.

c. Examples of the forms to be used in recording the observation data, along with graphs to be used in analyzing the progress of the program.

d. A schedule for observation of behavior and administration of reinforcers.

2. Given the complete statement of a CM program for modifying a specific classroom behavior, the teacher will implement the program in the classroom. Implementation of the program requires the following steps to be accomplished by the teacher:

   a. All of the materials specified in the program statement will be assembled prior to beginning the program.

   b. If baseline data has not been obtained, the teacher (or teacher aide) will observe and record the specific inappropriate behavior for five to ten days.

   c. The programs should be started on a Monday by reading the set of instructions to the student(s) and class.

   d. Following the schedule for observing behavior and administering reinforcement for the appropriate behavior, the teacher should record and graph the behavioral data daily. At the end of a two-week period, the teacher should analyze the charted data and determine whether the program should be continued as is, modified, or ended.

   e. When the program is concluded, a brief report should be prepared according to the following format:

      (1) Description of inappropriate and desired behaviors, and what was maintaining the inappropriate behaviors.

      (2) A brief statement of the strategy used.

      (3) A list of reinforcers and description of how they were administered.

      (4) A graph of the behavioral data recorded.

      (5) Any comments you feel like making.

   f. Following the completion of the formal CM program, general CM procedures should be used periodically to maintain the appropriate behavior.

In the final two functions, the meaning of certain action verbs or other concepts may not be completely explicit. Therefore, the following definitions or alternate terms are provided.

Concept	Alternate Term
professional growth	development, advancement, improvement, betterment; an increase in capability as a teacher
innovative educational practice	novel, new, promising educational practice

Primary Action Verb	Alternate Verb or Phrase
facilitate	assist, aid, help, promote
review	examine, study, comment upon
determine	judge, decide
read	study, review

Primary Action Verb	Alternate Verb or Phrase
attend	be present at
select	choose, pick out
seek	solicit, request, ask for
try out	test, make a trial use of
reinforce	strengthen, "reward," acknowledge the worth of

III. Plan for and implement a program of professional growth for self and other teachers.

A. Identify areas for personal improvement

1. At staff meetings, informal staff gatherings, and on other occasions when teachers might congregate, the teacher should facilitate discussions related to professional growth. As an example, the teacher should be prepared to recommend possible activities that might lead to professional growth, as well as to react constructively to ideas about growth as proposed by other teachers. The teacher should not make unfair or unwarranted criticisms of the suggestions of other teachers, but should seek to provide positive, solution-oriented comments. Also, the teacher should encourage and reinforce attempts by other teachers to provide comments.

2. From discussions with the program coordinator and with his assistance, the teacher should determine areas where his teaching performance is weak and where personal improvement might be desirable. Considering the fact that few people are perfect, the teacher should be able to list two or three areas at any time.

B. Determine possible courses of action to bring about improvement in professional capabilities.

1. Given access to selected journals and/or magazines whose intended audience is the professional teacher, the teacher should routinely read (or scan) such publications for the purpose of acquiring information and suggested actions one might take with respect to improving his professional capabilities. The teacher should be prepared to report to fellow teachers some of the actions described or recommended in the publications.

2. When feasible in terms of teaching load, location, and cost, the teacher should attend conferences, symposia, and workshops that are focused on professional problems of interest to the teacher. The teacher should be prepared to report to fellow teachers any problems and recommendations that might emanate from such conferences.

C. Encourage personal improvement efforts by other teachers.

1. In all types of situations where teachers may engage in discussions focused on professional growth, the teacher should consistently reinforce the efforts of other teachers to suggest positive ways to improve their teaching. As convenient and appropriate, the teacher should publicly acknowledge the merit of suggestions of other teachers or otherwise make known his support of the suggestion.

2. When invited by a fellow teacher (or program coordinator) to review the products (lesson plans, objectives, test items, etc.) and classroom activities (teaching practices, learning activities, etc.) of a fellow teacher, the teacher should reinforce the efforts of the fellow teacher to produce quality instructional materials and to employ effective practices in teaching. As convenient and appropriate, the teacher should publicly acknowledge the merit of the other teacher's products and practices. This may be done in the presence of the fellow teacher, other teachers, principals, program coordinator, etc.

IV. Examine and plan for a test of innovative practices in the classroom.

A. Identify and select feasible innovative training practices.

1. When feasible in terms of teaching load, location, and cost, the teacher should attend conferences, symposia, and workshops that are devoted to discussion and/or evaluation of innovative training practices. The teacher should be prepared to report to fellow teachers regarding the status of such practices and should be able to defend any recommendation he might make that such practices should be instituted in his school district.

2. The teacher should routinely read (or scan) reports, articles, and books that describe and tout innovative training practices. The teacher should be prepared to report to fellow teachers regarding his understanding of the status of such practices and should be able to defend any recommendation he might make that such practices should be instituted in his school district.

B. Arrange for test and evaluation of selected innovative practices.

1. After attending conferences or after reading literature touting given innovative practices, the teacher should be able to select a new educational practice for trial implementation in his classroom. The teacher should be prepared to defend his selection of an innovative practice to implement.

2. After having selected a given innovative practice to implement in his classroom, the teacher should seek support and approval of his principal and other administrative officials for trial use of the educational practice. To improve his chances of obtaining approval, the teacher should carefully document the evidence in favor of the new educational practice and be prepared to defend his selection of it.

3. After receiving approval and support from his principal and other administrative officials, the teacher should be able to try out a new educational practice. The teacher should use controls as appropriate and provide for a valid evaluation of the effects of the practice.

Appendix B

PROGRAM COORDINATOR PERFORMANCE OBJECTIVES

I. Facilitate improvements in the learning environment in each teacher's classroom.

A. Diagnose the learning environment in each classroom with regard to:

1. Aversive stimuli. Monitor for aversive practices by the teacher and aide, aversive social behaviors among students, and aversive physical conditions.

2. Specified achievement. Monitor for the existence and use of both terminal and enabling instructional objectives with mastery learning requirements.

3. Response-rich learning activities with contingent positive reinforcement.

4. Learning facilitation behaviors.

5. Disruptive behaviors.

B. List all possible courses of action for correcting each deficiency and negotiate an appropriate change program for each diagnosed deficiency. Such programs may call for:

1. Behavior changes in teacher and aide behavior, in student social behaviors, and in student learning facilitation behaviors.

2. Development or acquisition of instructional objectives or instructional materials. These programs may call either for selecting and buying commercial materials or developing teacher-made materials. Cooperative activity may be required among teachers either in selecting commercial objectives and materials or in dividing the work required to develop teacher-made objectives or materials.

C. Follow-up each change program.

1. Insure that appropriate support is coordinator for each program. Such support may include released time for group meetings, secretarial support, books, journals, tangible reinforcers, changes in policies, etc.

2. Monitor the implementation of each program.

a. Behavior change programs. Periodically visit each classroom and observe behavior and learning environment. In addition, periodically meet with each teacher to discuss progress of each program.

b. Cooperative programs among teachers. Insures that each teacher understands his part of the effort. Periodically meet with teachers to review progress.

c. Acquisition of commercial materials. Insure that orders are placed and insure that materials are speedily distributed when they arrive. Visit classrooms to insure that materials are properly used.

3. Negotiate modifications in change programs, if necessary.

4. Solicit a formal report at the completion of each behavior change program from each teacher.

II. Facilitate professional growth in each teacher and innovative practices in each classroom.

A. Arrange for and encourage teachers to meet together to discuss the development of programs for their own professional development and innovative classroom practices. Reinforce teachers for change activities and refrain from non-constructive criticism.

B. Arrange to provide teachers with access to books, journals, and magazines whose intended audience is the professional teacher and encourage them to attend conferences, symposia, and workshops that are focused on professional problems of interest to the teacher and on classroom innovations.

C. Coordinate support requirements for each teacher's professional growth and classroom innovation activity.

D. Reinforce professional development activities and classroom innovations undertaken by each teacher. At the very least, visit the classroom to observe the innovation as soon as the teacher indicates that he is ready for such a visit. Also, provide social reinforcement.

E. Encourage and arrange for teachers to report on their innovative activities to other teachers in the district.

Appendix C

INFERRED ACHIEVEMENT TEST OBJECTIVES WITH SAMPLE TEST ITEMS

Given a word of one or two syllables pronounced orally by the teacher, select from four letters the letter with which the word begins.

Test Item:

1. Teacher says: Dog. Student selects initial letter from these four letters: p, h, t, d.

2. Teacher says: After. Student selects initial letter from these four letters: g, a, l, f.

Given a word of one or two syllables pronounced orally by the teacher, select from four letters the letter with which the word ends.

Test Item:

1. Teacher says: Nail. Student selects final letter from these four letters: b, l, n, a.

2. Teacher says: Table. Student selects final letter from these four letters: t, m, q, e.

Given a single printed key letter, select from four alternatives the one letter that is the same as the key letter. Key letters and letters in the alternatives may be small or capital, and they may be unlike in size, e.g., key letter small, alternative letters capitals.

Test Item:

1. G L V G E

2. K q k q l

3. p z p r v

Given a word pronounced orally by the teacher, select from four printed words the word that the teacher pronounced. The words should contain from three to seven letters and should have one or two syllables.

Test Item:

1. grab grip grab grow grain

2. won win war will won

Given a passage having the following characteristics:

a. Approximately 30 to 85 words,

b. One paragraph,

c. An average of 10 to 12 words per sentence,

d. An average of 1.1 to 1.3 syllables per word, and

e. Dealing with animals, boat rides, airplanes, or buildings,

the student will respond to as many of the following kinds of items as are appropriate:

Test Item:

Mary had a fuzzy little cat. She played with it each day after school. Sometimes she took it to the park and let it climb the walnut tree. She and the cat were very happy. (35 words)

1. Mary's cat was

   big
   fuzzy
   yellow
   sick

2. Mary took her cat to the

   store
   street
   house
   park

3. Where was the walnut tree?

   in the backyard
   at the school
   in the park
   in the forest

4. Mary played with her cat

   sometimes
   weekends
   daily
   mornings

5. Which of these is the best title for the story?

   Books
   Cats
   Cars
   Toys

Given a riddle, the pupil must be able to correctly supply a rhyming word as the answer.

Test Item:

"Flower, flower,
Pretty as can be,
Flower, flower,
Grow for _____."

Given a selection of spoken words, the child will identify the short vowel sound.

Test Item:

Tell me the short vowel sound in these words: hill, sun, top, pet, hat.

Given a group of compound words, the student must correctly divide each word into its two words.

Test Item:

Draw a vertical line between the two words.

necktie
fingernail
fireman
fishhook
hotdog
treetop
raincoat

Given a group of words, the pupil must correctly use the following verb endings: "s", "ed", and "ing".

Test Item:

Fill in the correct ending (s, ed, ing) for the action words in these sentences:

e.g. Tom jump___ over the box last night.
The dog is bark ____.

Appendix D

TEACHER QUESTIONNAIRE

June 5, 1972

Name _____

School _____

Grade _____

In an attempt to evaluate the HumRRO Project, your best judgment is requested in answering the following questions. Check the blank that is appropriate. ANSWER ALL QUESTIONS. *Return to Fred Rivkin by June 13, 1972.* Please use the enclosed envelope.

1. With respect to the objectives *prepared during last summer's workshop*, how much have you:

   a. Used them in preparing your lesson plans?

   13 quite a lot
   8 a fair amount
   3 some
   3 hardly at all
   7 not at all
   1 no response

   b. Used them to check-off pupil progress?

   11 quite a lot
   11 a fair amount
   3 some
   1 hardly at all
   8 not at all
   1 no response

2. With respect to the *textbook objectives* (math modules, other books), how much have you:

   a. Used them in preparing your lesson plans?

   10 quite a lot
   13 a fair amount
   5 some
   2 hardly at all
   5 not at all

   b. Used them to check-off pupil progress?

   12 quite a lot
   13 a fair amount
   4 some
   1 hardly at all
   5 not at all

3. In addition to the above, how often have you prepared your own set of objectives?

14	quite a lot
4	a fair amount
15	some
1	hardly at all
1	not at all

4. If you prepared your own objectives, how much have you:

   a. Used them in preparing your lesson plans?

20	quite a lot
4	a fair amount
9	some
0	hardly at all
1	not at all
1	no response

   b. Used them to check-off pupil progress?

18	quite a lot
6	a fair amount
10	some
0	hardly at all
0	not at all
1	no response

5. In what content areas have you used the objectives listed below?

Content Area	Workshop Objectives	Textbook Objectives	My Own Objectives
Reading	24	22	26
Arithmetic	22	20	18
Science	2	13	13
Health	2	9	13
Social Studies	5	12	12
Spelling	4	19	22
Language Arts	7	18	26
Handwriting	1	14	18

PLEASE NOTE: You may need to check more than one kind of objective for a given content area.

6. Have you attempted to individualize instruction? 34 YES 1 NO

7. If YES to item 6, did you use:

a.	Commercially prepared materials?	29 YES	6 NO
b.	Your own materials?	28 YES	7 NO

8. If YES to item 6, in what content area(s) did you attempt to individualize instruction:

	YES	NO
Reading	31	1
Arithmetic	24	11
Science	4	29
Health	3	30
Social Studies	5	28
Spelling	19	16
Language Arts	13	19
Handwriting	12	20

9. In your opinion, how successful were you in individualizing instruction:

10 quite successful
16 fairly successful
7 slightly successful
1 had problems
0 it didn't work at all

10. Have you applied any formal CM Programs in the classroom?

31 YES 4 NO

11. In your opinion, did your use of positive reinforcement practices over the past year show:

12 a big increase
16 a moderate increase
5 a slight increase
1 no increase at all
1 a slight decrease

12. What do you find to be the most effective disciplinary practice(s) in managing your students?

13. What aspects of the project do you recommend being continued next year:

29 Help in individualizing instruction
14 Help in using objectives in teaching
24 Help in using Contingency Management (CM) in the classroom
12 Classroom observation by P.C.
13 Lunch time study sessions
16 The Bugle
11 Technical assistance by HumRRO personnel
34 Teacher aides assigned to project teachers
29 Funds for reinforcers
_____ (Add your own)
_____ (Add your own)

14. If you had the power and authority, what one thing would you change in the project to make it more effective?

_____

_____

_____

_____

15. List ALL gripes and praises! (may use back of this sheet)

Appendix E

ADMINISTRATOR EVALUATION

June 6, 1972

In an attempt to evaluate the HumRRO Project, your best judgment is requested in answering the following questions. Check the blank(s) that is appropriate. Be sure to answer ALL questions. *Return to Fred Rivkin by June 13, 1972.*

I. How many Contingency Management (CM) Programs, both academic and social, have been carried out by your staff?

__1__ a large number
__1__ quite a few
__2__ a few
__0__ one or two
__0__ none to my knowledge

II. Changes in your staff's performance (competence in using CM and objectives) have been:

__1__ quite substantial
__2__ substantial
__1__ moderate
__0__ very slight
__0__ what changes?

III. How often did individual staff members consult with or inform you of their proposed or on-going CM Programs?

__0__ quite often
__2__ often
__2__ on occasion
__0__ seldom
__0__ never

IV. What is the attitude of the project teachers toward the program?

__1__ extremely favorable
__3__ favorable
__0__ neutral
__0__ unfavorable
_____ extremely unfavorable

V. What do you perceive to be the community's attitude toward the program?

0 extremely favorable
3 favorable
1 neutral
0 unfavorable
0 extremely unfavorable

VI. What aspects of the project do you recommend being continued next year?

4 Help in individualizing instruction
4 Help in using objectives in teaching
2 Help in using CM in the classroom
2 Classroom observation by Project Coordinator
2 Lunch time study sessions
1 *The Bugle*
2 Technical assistance by HumRRO personnel
2 Teacher aides assignments to project teachers
0 Funds for reinforcers
0 (Add your own)
0 (Add your own)

Appendix F

AGREEMENT BETWEEN PROJECT TEACHERS AND PROGRAM COORDINATOR 1971-72

A. Program Coordinator responsibilities:
The PC agrees to the following:

1. Observe teacher behavior in the classroom and provide feedback on teacher performance. Classroom visits will be made on a regularly scheduled basis throughout the school year.
2. Provide assistance in:
   a. Planning and carrying out CM programs.
   b. Overcoming technical problems associated with program operation.
   c. Creating a positively reinforcing learning environment.
   d. Using individualized instruction.
3. Prepare and distribute status reports on the project.
4. Publish and distribute a project newsletter on a regular basis.
5. Provide administrative support for innovative teaching practices consistent with individualization, utilization of objectives and CM.
6. Provide teacher aide assistance to project teachers. This assistance is, of course, dependent on the level of federal and state funding.
7. Provide funds for the purchase of reinforcers to be used in CM programs.
8. Provide funds for individualized instructional material that is consistent with project objectives.
9. Publicly acknowledge, verbally and in writing, teachers who conduct successful and/or innovative teaching practices that are consistent with workshop objectives.

B. Follow-up program teacher responsibilities:

1. Create a positively reinforcing non-aversive learning environment in the classroom. This is determined by the observation of teaching behaviors. Some of the behaviors to be observed include the number of:
   a. Response opportunities.
   b. Approving behaviors.
   c. Disapproving behaviors.
2. Use pupil performance objectives in the teaching of reading and arithmetic. Use a check-off system to record pupil achievement of objectives.
3. Provide opportunities for pupils to learn on an individualized or self-paced basis.
4. Use contingency management procedures and techniques in a formal program to change pupil's behavior (social and academic) as the need arises. Before beginning a CM program, submit a written description of program procedures to the PC. Supply data on the results of the program.
5. Attend regularly scheduled follow-up meetings with project staff.
6. Prepare and submit reports on project progress.

The achievement of these objectives should result in:

1. The teacher passing a written CM examination and becoming certified in contingency management.

2. Each pupil in the class improving by 1 grade point equivalent in reading and arithmetic.

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